

## **The use of gelatin for biofunctionalising porous Titanium scaffolds**

Vanderleyden E.<sup>1</sup>, Van Bael S.<sup>2,7</sup>, Chai Y.C.<sup>3,4,7</sup>, Chen Y.<sup>3,5,7</sup>, Schrooten J.<sup>6,7</sup>,  
Schacht E.<sup>1</sup> and Dubrue P.<sup>1</sup>

1 Polymer Chemistry & Biomaterials Research group, Department of Organic Chemistry, University of Ghent, Ghent, Belgium,

2 Department of Mechanical Engineering, Division of Production engineering, Machine design and Automation, Katholieke Universiteit Leuven, Leuven, Belgium

3 Laboratory for Skeletal Development and Joint Disorders, Department of Musculoskeletal Sciences, Katholieke Universiteit Leuven, Leuven, Belgium

4 Department of Biomedical Engineering, Faculty of Engineering, University of Malaya, Kuala Lumpur, Malaysia

5 School of Pharmacy, Shanghai Jiao Tong University, Shanghai, People's Republic of China

6 Department of Metallurgy and Materials Engineering, Faculty of Engineering, Katholieke Universiteit Leuven, Leuven, Belgium

7 Prometheus, Division of Skeletal Tissue Engineering Leuven, Katholieke Universiteit Leuven, Leuven, Belgium

The metal of choice to treat critical size bone defects are up to today still titanium (Ti) and its alloys. These biometals posses advantageous characteristics for bone tissue engineering applications including excellent corrosion resistance, superior biocompatibility and appropriate mechanical properties. Despite the strong biocompatibility the bone binding capacity and the bioactivity of Ti are not sufficient to realise a true bond between the implant and the surrounding bone tissue, implying a non-optimal osseointegration.

In the present work, we studied the immobilisation of the biopolymer gelatin type B onto the surface of three dimensional regular Ti scaffolds to improve their surface bio-activity. Gelatin is derived from collagen, one of the main constituents of the extracellular matrix, and has already been used for numerous industrial, pharmaceutical and biomedical applications. The successful immobilisation of the gelatin coating was demonstrated by different techniques including X-ray photoelectron spectroscopy, surface energy determination and fluorescence microscopy. Results show a homogeneous coating that is stable for at least 24h in PBS at 37°C. During subsequent in vitro cell adhesion and culture studies with human periosteal derived cells we could observe a homogeneous cell distribution and the onset of a mineralisation process. This newly developed coating procedure outperformed the previously reported silanisation procedure for immobilising gelatin.

The bio-activity of these stable gelatin coatings will be further enhanced by applying a secondary coating using the cell-attractive protein fibronectin. The reproducible

immobilisation process developed will allow for a controlled biomolecule presentation to the surrounding tissue.

#### Acknowledgment

The authors acknowledge the financial support of the Institute for the Promotion of Innovation by Science and Technology in Flanders (Belgium), the Belgian Research Policy (IUAP-V-03) and the K.U.Leuven IOF Knowledge Platform 'Prometheus' IOFKP/07/004 and IDO project 05/099 – QuEST.